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Formulation of Monetary Policy by the Federal Reserve: Rules vs. Discretion

July 19, 2001

Congressional Research Service
https://crsreports.congress.gov
RL31050

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

Would the economy be better off if the responsibility for setting the federal funds rate were taken from Federal Reserve (Fed) Chairman Alan Greenspan and his colleagues on the Federal Open Market Committee (FOMC) and replaced by a simple rule? A surprising number of economists would answer yes. John Taylor, now an Undersecretary of the Treasury, formulated what is now called the "Taylor rule" in which interest rate changes would automatically be based on gaps between inflation and growth and their desired or sustainable long-run rates.

Some Members of Congress have expressed a dissatisfaction with the Fed's use of discretion, and have sought alternative policy options; rules offer one alternative. Although day-to-day control of monetary policy has been delegated to the Fed, the ultimate goals are determined by Congress. Thus, Congress retains the right to change the current personal, discretionary regime to a monetary policy based on a formula incorporated in a rule.

Proponents of using a rule such as the Taylor rule argue that basing policy on explicit, quantitative goals would promote economic efficiency and individual decision making because it would eliminate monetary policy "surprises" inherent in the informal discretionary process now in place. Rule proponents point to the 1970s when they believe poorly executed discretionary policy led to double-digit inflation despite sluggish economic growth. They attribute this to the Fed's unwillingness to accept slower short-term growth for the sake of price stability and to resist "fine-tuning" policy in the pursuit of unrealistic goals. The steps ultimately taken to regain control over the resulting inflation caused the worst recession since the Great Depression. It is argued that if the Fed's credibility had not been so low by this point, inflation could have been eliminated with a much milder recession.

Under a rule, necessary but politically unpopular decisions would be automatic – inflation could no longer drift upward in pursuit of temporary employment gains. Switching to a rule could reduce uncertainty, enhance credibility and accountability, and improve monetary policy effectiveness. To those who see the current regime as undemocratic, rules offer a way to limit the discretionary power of the unelected FOMC.

Defenders of discretionary policymaking argue that setting monetary policy in a highly complex economy cannot be reduced to a single equation. They point out that this is especially true at times of financial crisis, when the Fed's ability to increase financial liquidity is instrumental for quelling panic. Discretionary policy may have been executed poorly in the 1970s, but the 1990s economy has enjoyed low inflation and high, stable economic growth. They also question the real-world usefulness of the simple models that rule proponents use to demonstrate the superiority of Taylor rules. There are a number of practical problems that would arise if a Taylor rule were implemented. These include lags in the effectiveness of monetary policy, shortcomings with economic data, and uncertainty about key economic variables such as the natural growth rate. *There are no plans to update this report*.

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Under the chairmanship of Federal Reserve (Fed) Chairman Alan Greenspan, monetary policy has arguably enjoyed an unprecedented record of success and popularity. His ability to diagnose the economy's needs and adjust monetary policy accordingly has won him a reputation with the press for being "omniscient" and "infallible." For that reason, it may be surprising that economic literature is replete with suggestions for monetary policy "rules," or quantitative formulas. This literature suggests a very different policy regime than the discretionary regime that operates at present. It would shift monetary policy away from the informal, personalized decision-making process that the Fed now employs and towards more structured, codified, predictable decision making. This report explores the historical evolution of policy rules and the arguments employed for and against a rule-based policy regime.

Some members of Congress have expressed a dissatisfaction with the Fed's use of discretion, and have sought alternative policy options. Rules offer one alternative, but may have costs of their own worth considering. Although day-to-day control of monetary policy has been delegated to the Fed, the ultimate goals and structure of the Fed are the prerogative of Congress. Thus, Congress retains the right to change the current personal, discretionary regime to a rule-based regime.

The Present Discretionary Policy Regime

If the lessons of macroeconomic stabilization policy were to be stated in one sentence, that sentence would likely be "while there may be a short-run tradeoff between unemployment and inflation, there is no long-run tradeoff." In the long run, overall unemployment is determined by microeconomic conditions in the labor market and inflation is caused by excessive money creation by the Federal Reserve (Fed). But in the short run, monetary policy affects the business cycle, and there is strong reverse correlation between growth and unemployment. The task of monetary policy is to attempt to maintain a balance between this short-run tradeoff and the long-run "neutrality" of money.[1]

Monetary policy is conducted primarily through the targeting of the federal funds rate, the overnight inter-bank interest rate. Influencing this rate changes the availability of credit in financial markets. The Federal Reserve's Open Market Committee (FOMC) selects a target rate it believes to be appropriate for economic conditions and maintains it through the purchase and sale of U.S. Treasury securities. The FOMC has eight scheduled meetings a year to determine whether the prevailing interest rate target remains appropriate given the economic environment, or whether it should be altered. It makes this decision in a private meeting, and releases a joint communique at the end of the meeting explaining its decision. If the Chairman of the Fed wants the FOMC to consider changing interest rates between scheduled meetings, he can call unscheduled meetings at any time. Chairman Greenspan did so twice in the first four months of 2001.[2]

There are rarely easy answers in determining the correct monetary policy stance for three reasons. First, monetary policy influences the most crucial variables – inflation and output growth – very indirectly. This is because these variables respond to interest changes in unpredictable ways after long time lags. Second, the variables that the Fed can control directly – short-term interest rates, the money supply, the exchange rate, the price of gold – are only meaningful if they are closely, promptly, and predictably related to overall economic stability. It would be difficult to

[1] See U.S. Library of Congress, Congressional Research Service, *Inflation and Unemployment: What Is the Connection?* by Brian Cashell, CRS Report RL30391 and *Monetary Policy: Current Policy and Conditions*, by Gail Makinen, CRS Report RL30354.

[2] For an overview, see U.S. Library of Congress, Congressional Research Service, *Monetary Policy: Current Policy and Conditions*, by Gail Makinen, CRS report RL30354.

demonstrate that any of these variables have this relationship. Third, the Fed can choose only one policy tool at a time, so it can influence only one policy variable. Yet it is concerned with at least two variables, inflation and output growth. Hence, pursuing more than one goal involves tradeoffs in the effectiveness that either variable can be influenced. (If more goals are added, then its influence over each goal is diluted further.) Since monetary policy influences output growth more quickly than inflation, but is believed to have no permanent effect on output growth, in many ways this is a tradeoff of short run benefits and long run costs. For these three reasons, the current system is highly reliant on the judgement of FOMC members in determining the correct policy stance.

The FOMC bases its interest rate decisions on the mandate set forth by the Federal Reserve Reform Act of 1977 (P.L. 95-188). This act calls for the Fed to maintain maximum employment, stable prices, and moderate interest rates – but does not define what those goals are quantitatively.[3] These goals are legally stipulated in such a way that the Fed has considerable latitude in reaching its decisions – nearly any policy stance can be justified by appealing to one of its mandated goals. Its descriptions of its policy motivations are qualitative, rather than quantitative, and thus they cannot be judged against an objective standard by outsiders. There is a cottage industry of private economic forecasters, hired by businesses to aid their investment planning, who try to predict what the Fed will do next. While the forecasters are frequently accurate, since the Fed's decision-making process is discretionary, at some level these forecasts are akin to reading tea leaves.

The Policy Rule Critique

The current policy regime remains a source of dissatisfaction to many economists. This is not because they necessarily believe that the Fed has performed poorly in the last decade, but rather because they believe that there have been times in the past – most recently in the 1970s – when that was the case. Thus, they argue, mechanisms should be put in place to prevent a return to the "bad old days." They argue that many of the Fed's decisions in the 1970s were made for small short-term gains at the price of large long-term losses.

In fairness to the Fed, its decisions may have resulted from following the teachings of the mainstream economic theory at the time. It is changes in theory, however, that have made discretionary policy so unappealing to some economists. The Fed's decisions in the 1970s were also made at a time when the economy was being hit by a series of negative, unexpected shocks. Notably, the Fed was faced with a slowdown in productivity growth that lasted 20 years and a series of oil shocks that would have made stabilization policy extremely difficult under any circumstances.

At present, there is very little that can be done to prevent the Fed from making errors, at least in the short to medium term. Critics believe that if policy were set by quantitative rules, it would limit errors and actions that are counter-productive in the long run. As economist William Poole describes it, "you would not want to fly in a plane whose pilot had been merely instructed to 'use your best judgment, experiment, and feel your way along, fly wisely, incorporating all available information.'"[4] Yet this is the essence of discretionary policy. Even if monetary policy has been successful in the Greenspan era, critics argue that rules would give a predictability and openness

[3] The 1978 Humphrey-Hawkins Act (P.L. 95-523) sets numerous goals for the overall federal government. It requires the Fed to report to Congress semi-annually to explain how Fed policy is contributing to the achievement of these goals. For more information, see U.S. Library of Congress, Congressional Research Service, *Redefining the Federal Reserve's Monetary Policy Mandate*, by Thomas Woodward, CRS report 95-394E.

[4] Robert Solow and John Taylor, *Inflation, Unemployment, and Monetary Policy*, (MIT Press, Cambridge: 1998), p. 79.

to monetary policy that would enhance corporate and individual decision making, and thus economic performance.

The "Taylor Rule"

A growing synthesis between the predictive power of Keynesian theory and the theoretical implications of the rational expectations school of thought led more and more economists to endorse the work of economist John Taylor, now an Undersecretary of the Treasury.[5] Taylor's work on monetary policy nicely encapsulates the growing consensus in macroeconomics. Unlike the rational expectations literature, his work recognizes that economic performance can be improved in the short run through counter-cyclical monetary policy. Unlike Milton Friedman's rule, described below, it recognizes that the relationship between money growth and aggregate demand is too unstable to base policy upon it. But like both Friedman and the rational expectations economists, Taylor questions the advantages – theoretically and empirically – of discretionary monetary policy. The "Taylor rule," therefore, attempts to "tie the hands" of policymakers, but in a manner that recognizes that there is a desirable short-run tradeoff between unemployment and inflation, if kept within strict limits. The weakness of previous rule-based approaches was that they seemed incapable of responding to changing economic conditions. By contrast, Taylor's rule allows monetary policy to proactively respond to changing economic conditions without being discretionary.

Taylor suggests that monetary policy can be boiled down to two simple goals. The business cycle is caused by shocks to the macroeconomy that create two undesirable effects – deviations in the inflation rate and deviations in the growth rate of output.[6] This is comparable to the old unemployment/inflation tradeoff, but Taylor focuses on output growth because its relationship with inflation is more direct than unemployment.[7] The Fed can manipulate short-term interest rates to minimize the deviation of both, as it does at present. Thus, Taylor's rule does not represent a departure from the current goals of monetary policy. Instead, it represents a departure in the methods used to reach those goals. Instead of basing interest rate decisions on the deliberations of FOMC members, the federal funds rate would be automatically changed on the basis of one equation, so that changes in the economic growth rate or inflation rate would systematically and predictably lead to changes in interest rates. For example, he suggests the rule:[8]

$$FFR = (R^* + I) + a(I - I^*) + b(Y - Y^*)$$

where:

FFR = the federal funds rate
R* = the economy's equilibrium real (inflation-adjusted) interest rate
I = the inflation rate
I* = the desired inflation rate

[5] See the appendix for a further discussion of the rational expectations critique of Keynesianism.

[6] These shocks can take many forms – for instance, shocks to aggregate demand through changing expectations, or supply shocks to productivity or from resources (e.g., an oil shock). The theoretical importance of these shocks is that they explain why the economy does not always grow smoothly and avoid recessions.

[7] While unemployment is influenced by the business cycle, the "natural rate of unemployment" is determined by characteristics of the labor market, cannot be influenced by monetary policy, and may not be constant. In fact, it seems to have fallen in recent years. For more information, see U.S. Library of Congress, Congressional Research Service, *Why Has the Unemployment Rate Fallen When Inflation Is Stable?* by Marc Labonte, CRS report RL30738.

[8] John Taylor, "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy*, 1993, p. 195-214.

Y = the economic growth rate
Y* = the economy's long-run sustainable rate of growth
a,b = parameters chosen by the policymaker

Thus, to formulate a Taylor rule, policymakers must have a reliable (and constant) estimate for the equilibrium real interest rate (R*) and the long-run sustainable rate of growth (Y*). They must identify an acceptable rate of inflation (I*), recognizing the drawbacks of an inflation rate that is too low or too high. And they must choose parameter values for a and b, based upon how responsive they desire interest rate changes to be to changes in inflation and output and the relative harmfulness of higher inflation and lower output. For example, imagine that the equilibrium real interest rate (R*) equals 2%, policymakers choose a desired inflation rate of 2%, and the long-run sustainable rate of growth (Y*) is believed to equal 3%. Policymakers choose to set a and b equal to .5, as Taylor does in his example. In that case, the federal funds rate would be determined by the equation:

$$FFR=(4\%)+.5(I-2\%)+.5(Y-3\%)$$

If economic growth fell (rose) one percentage point below (above) the sustainable rate of growth, then the Fed would decrease (increase) the inflation-adjusted federal funds rate by one-half percentage points.[9] If the inflation rate is one percentage point above (below) the desired inflation rate, the Fed would increase (decrease) the inflation-adjusted federal funds rate by one-half percentage point.[10] For example, if the economy currently has a growth rate of 4% and an inflation rate of 3%, then the federal funds rate would be increased by one percentage point (one half percentage points due to inflation and one half due to growth) to 5% from its long-run trend rate of 4%.

Research on Taylor-type rules focuses on creating models of the economy that are meant to be similar to the real economy, and then examining how inflation and economic growth would have occurred if a Taylor rule were in place.[11] According to its proponents, the volatility of inflation and growth would have been lower under a Taylor rule than the Fed has achieved historically. To judge which rules produce the best results, the models make simple assumptions about how much worse off people become when inflation or economic growth is volatile. This judgement arises because of the inflation-output tradeoff: the Fed could probably keep inflation constant at all times, but to do so it would have to let output fluctuate to an unacceptable degree. Likewise, keeping output constant would cause unacceptably large fluctuations in the inflation rate. Were the Fed to begin executing monetary policy on the basis of the Taylor rule, presumably the democratic process would have a role in determining the relative weighting of these two goals. Taylor's research suggests that setting the weights equal (i.e., 0.5) is the best policy to pursue. This belief is not based on his assumptions of people's preferences; it is based on research that suggests to him that if output growth is weighted more heavily, little additional output stability will be achieved at the cost of much greater inflation variability, and vice versa.

[9] Aggregate demand shocks are typified by falling (rising) inflation and falling (rising) growth. For this type of shock, the Taylor rule instructs interest rates to move together in the same direction. By contrast supply shocks, like an oil shock, are typified by rising (falling) inflation and falling (rising) output. For this type of shock, the interest rate dynamics cancel each other out, leading to a more neutral policy.

[10] The nominal federal funds rate would rise by one and a half percentage points since the inflation rate enters the equation twice. Nominal interest rates are equal to real interest rates plus the inflation rate, which explains why the first term of the rule is (R*+I). Hence, a rise in inflation would never outstrip the rise in the federal funds rate.

[11] See John Taylor, ed., *Monetary Policy Rules,* (University of Chicago Press: 1999).

Other researchers have added other terms to "Taylor rules." Some researchers include the exchange rate in the rule determining the interest rate. This may be more useful for smaller economies highly dependent on trade than the United States, a large economy whose output is mostly produced for domestic consumption. Other researchers have limited how much the interest rate can change in the short run. These alternative rules are motivated by research that suggests that excessive interest rate fluctuations have undesirable economic effects. For example, they make business planning more difficult and can cause financial difficulties through balance sheet effects.[12] Other Taylor rules have been based on forecast values of inflation and economic growth rather than actual values. This was motivated by the desire to address the lags that occur in data collection and policy effectiveness. Most Taylor rules are limited to a few variables, however, because interest rates can only achieve one goal completely. Each additional goal dilutes the influence that interest rate changes can have on the other goals.

Different Views on Policy Rules

Monetary policy rules are a standard tool of macroeconomic modeling today. For some economists, they are merely a handy instrument to model in a simple, tractable way, but do not make for practical economic policy in reality. Since high inflation is no longer a threat and the Fed's actual behavior in the 1990s has closely mirrored what a Taylor rule would have mandated, they would argue that the argument for rules is moot.[13]

Some other economists would see a policy rule as one more research tool to be added to the Fed's arsenal. For example, Martin Feldstein believes that

> rules should not be viewed as substitutes for judgment by the monetary authorities but rather as inputs into that judgmental process. A good rule is therefore one that provides a useful starting point for central bank deliberations.[14]

In this perspective, the Fed should devise many different models of the economy and construct policy rules for each model. In reaching its decision about policy changes, it could then refer to what each rule recommends. To an extent, the Fed already refers informally to such models to help guide its decisions. This process could become more formalized and given more importance than it is at present. Donald Kohn, Director of Monetary Affairs at the Federal Reserve, reports

> Federal Open Market Committee (FOMC) members are regularly given some information on the predictions from monetary policy rules.... But, in truth, only a few members look at this or similar information regularly, and the number does not seem to be growing.[15]

Other economists believe the Fed should switch to a policy rule regime under normal economic circumstances, with the option to use discretion and ignore rules in times of crisis or instability. John Taylor explains,

> In arguing in favor of policy rules I recognize that certain events may require that the rule be changed or departed from; that is, some discretion is required in operating the rule. But there is still a big difference between a policy approach that places emphasis on rules and one that does not. With a policy rule in mind the analysis of policy – including questions

[12] One reason that the Fed began targeting the federal funds rate again in the 1980s was because excessive interest rate volatility had been extremely unpopular with business and banks.

[13] Economist Benjamin Friedman takes this position in Solow and Taylor, *op cit*, pp. 55-63.

[14] John Taylor, ed., *Monetary Policy Rules*, (University of Chicago Press, Chicago: 1999), p. 120.

[15] Taylor 1999, *op cit*, p. 195.

> about whether a deviation from a rule is warranted – will tend to focus more on the rule rather than pure discretion.[16]

Some economists would argue that the advantages of a strict policy rule regime are so great that they outweigh the drawbacks of abandoning all discretion, which they would claim are mostly illusory anyway. For example, Robert Lucas and Thomas Sargent argue that

> theory predicts that there is no way that the monetary authority can follow a systematic activist policy and achieve a rate of output that is on average higher over the business cycle than what would occur if it simply adopted a no-feedback, X-percent rule of the kind Friedman and Simons recommended.[17]

Arguments in Favor of Rules

Prevents Short-Term Policymaking

Most economists believe that the U.S. economy suffered from needlessly poor monetary policy in the 1970s.[18] Oil shocks and sluggish productivity growth initiated this period of poor economic performance, but they believe the monetary policy response exacerbated and prolonged the period of "stagflation." The standard economic explanation of why the Fed employed the policy that it did in the 1970s was that it was attempting to exploit short-term gains at the expense of long-term economic well-being. The oil shock simultaneously increased inflation and decreased economic growth.[19] The Fed responded by using stimulative monetary policy to revive growth, at the expense of higher inflation. Ultimately, even the short-term gains it sought became illusory. Since people came to expect rising inflation, stimulative monetary policy did not "fool" people into producing robust growth – it was merely passed through to higher prices and the economy suffered the distortionary effects of high inflation.[20] Eventually, the Fed was forced to tighten monetary policy sharply from 1979 to 1982 to reduce inflation to acceptable levels, resulting in the sharpest recession since the Great Depression. This downturn may have been much less severe if inflation had not been allowed to creep up throughout the 1970s.

Why did the Fed make the decisions it did in the 1970s? Clearly, part of the problem was a lack of consensus by economists at the time that there was no long-run unemployment-inflation tradeoff. But some economists believe high inflation in the late 1960s and 1970s was due in part to an unwillingness by the Fed to take tough stances on the need for interest rate increases. Despite the Fed's independent status, some critics argue that the Fed is still run by human beings capable of human weaknesses who may implement policy that they know is sub-optimal. Absent any pressure, governors may still implement sub-optimal policies to gain popularity, for re-

[16] Solow and Taylor, *op cit*, p. 45.

[17] The authors use the terminology "activist policy" to describe "discretionary policy." Robert Lucas and Thomas Sargent, "After Keynesian Economics," *After the Phillips Curve*, Federal Reserve Bank of Boston Conference Series 19, June 1978.

[18] Nor is the 1970s experience the only recession that economists attribute to the Fed. One widely accepted explanation of the cause of the Great Depression blames the Fed's decision to allow the money supply to drastically shrink in the 1930s.

[19] See U.S. Library of Congress, Congressional Research Service, *Rising Oil Prices: What Dangers Do They Pose for the Economy?*, by Marc Labonte, CRS Report RL30634.

[20] See U.S. Library of Congress, Congressional Research Service, *Inflation: Causes, Costs, and Current Status*, by Gail Makinen, CRS report RL30344.

nomination or simply for complimentary media coverage.[21] While not necessarily a proponent of rules, former governor of the Fed Alan Blinder believes that the greatest pressure on the Fed today comes not from other government officials, but from a desire to please financial markets. The media constantly publicize the opinions of market analysts regarding the proper monetary policy and the Fed is well-aware that its decisions often cause large shifts in the prices of stocks and bonds. Blinder states,

> Herein lies an extreme irony. Maintaining a long time horizon is perhaps the principal raison d'etre for central bank independence. Yet a central banker who takes his cues from the markets is likely to acquire the markets' short time horizon. That is why it is just as important for a central bank to be independent of markets as it is to be independent of politics.[22]

A claimed benefit of rule-based monetary policy is the elimination of opportunities to make policy decisions that have a greater long-term cost than short-term benefit. By its nature, a simple Taylor rule is incapable of "exploiting" a short-term tradeoff through "surprise" policy changes – with a rule, interest rate changes would never be surprising or uncertain. Monetary policy rules could also remove any psychological influences on the formulation of monetary policy that may make it sub-optimal. A policy rule is automatic; it would not be influenced by public pressure, the desire to "please the market," or political intervention.

A counter-argument could be raised, however, that policy rule proponents have not considered. They assume that the rule would be agreed upon and then left unchanged. But what would prevent the alteration of a policy rule in order to "gun" the economy before an election? Simply instituting a policy rule is not a guarantee that monetary policy would become de-politicized.

Reduces Uncertainty / Enhances Decision Making

Rational expectations economic models developed in the 1970s were based on the principle that rational individuals make optimal decisions based on all of the information available to them. (See the appendix for a fuller explanation.) This had two important implications for monetary policy. First, it was no longer believed that the monetary authorities had superior knowledge in how to move the economy away from a disequilibrium through discretionary policy changes. Instead, monetary policy could only have real effects on private activity in these models if the monetary authority made surprise policy changes. Second, an important reason why individuals made mistakes was because of uncertainty. Because discretionary policy was not based on any quantitative, verifiable goal, it increased uncertainty, thus making output fluctuations more likely. If individuals have already made their best decisions, they cannot be made better off by policy changes.

The conclusions of rational expectations scholars enhanced the argument for rules. Previously, proponents of discretion had been able to argue that if policymakers did not make mistakes in the future, even though they had in the past, discretion was superior to rules because it was flexible enough to adapt to changing conditions. Now it was argued that even when discretionary policy

[21] Because of concerns about popularity, economist Frederic Mishkin believes that there is a bias towards changing interest rates too infrequently. He believes that this arises because the Fed is afraid that reversing a previous policy decision would imply to Congress and financial markets that the Fed had made a mistake; this makes monetary policy less responsive to economic shocks than it should be. Commentary in John Taylor, ed., 1999, *op cit,* p. 249.

[22] Alan Blinder, "What Central Bankers Could Learn From Academics – And Vice Versa," *Journal of Economic Perspectives,* v. 11, n. 2, Spring 1997, p. 15.

adapted correctly, it still made the economy worse off than a rule-based regime because it increased uncertainty.[23]

As powerful as these theoretical results may be, a look at the empirical evidence makes it clear that monetary policy, when well-executed, has real effects on the economy that help reduce fluctuations caused by the business cycle. The Taylor rule helps bridge the gap between these theoretical results and empirical evidence. It would allow monetary policy to change in order to reduce economic volatility, but it would do so predictably and systematically so that individuals would know what changes they can expect and can arguably incorporate those potential changes into their decisions. Instead of attempting to stabilize the economy through surprises, it stabilizes it predictably.

Credibility Enhances the Effectiveness of Monetary Policy

When the Fed undertook disinflation in the early 1980s, much economic research was devoted to questioning whether the monetary authority's credibility influenced the effectiveness of monetary policy. In the short run, inflation is partly determined by people's expectations of inflation, through the existence of devices such as contracts and menus. If the monetary authority decided to lower inflation, how long that decrease would take and how greatly it would reduce short-term growth would be determined in part by how quickly people's expectations changed. Many economists posed the question of how the monetary authority's credibility would influence those expectations. They concluded that a disinflation executed by a monetary authority with low credibility would be long and costly because people would only slowly incorporate lower inflationary expectations.[24] For example, when setting prices or bargaining wages, people would assume that the central bank would not follow through with its promises to disinflate. Interest rates might even need to be raised more than would otherwise be necessary to convince people that the central bank was committed to the policy change and they should alter their expectations. Alternatively, they concluded that people would change their expectations very quickly if the central bank was credible. If so, the disinflation would be short and have a smaller effect on output, and interest rates would need to be raised less.

Policy rules have been suggested as a way to enhance the central bank's credibility. Central banks could lose credibility by attempting to surprise markets, changing policy without clear reasons to do so, or altering policy for political pressures. A rule, if strictly enforced, would be immune from any of these possibilities. Under a credible rule, expectations should change rapidly, making interest rate changes more powerful.

Increased Accountability / Clarification of Policy Goals

Some economists bemoan the lack of objective, numerical goals to guide the Fed's actions. In the Greenspan era, the absence of numerical goals may seem irrelevant, but historically it is striking. While many people undoubtedly considered the double-digit inflation that monetary policy accommodated in the 1970s to be unacceptably high, there was certainly nothing in the Federal Reserve Act defining it to be so. As a result, it is very difficult to objectively measure how successfully monetary policy has been executed. Rather than aiming for a goal, the Fed issues

[23] Stanley Fischer, *Rules versus Discretion in Monetary Policy*, National Bureau of Economic Research working paper 2518, 1988.

[24] See Robert Barro and David Gordon, "Rules, Discretion, and Reputation in a Model of Monetary Policy," *Journal of Monetary Economics 12*, 1983, p. 101 and Kenneth Rogoff, "The Optimal Degree of Commitment to an Intermediate Monetary Target," *Quarterly Journal of Economics 100*, 1985, p.1169.

subjective, qualitative statements to the public after FOMC meetings which, it is argued, lack any consistent rationale for its actions. Alan Blinder complains that

> Policymaking in the FOMC tends to be far too situational. Consensus is reached on a meeting-by-meeting basis, based on a painstaking analysis of the current macroeconomic situation and near-term outlook. But rarely is any attempt made to reach agreement on the basic conceptual framework for monetary policy – including the ultimate targets and the relative weights attached to each.[25]

Hence, no attempt is ever made to define precisely what macroeconomic conditions people prefer. For example, would people prefer less output growth variability (and more inflation variability) than the Fed pursues at present, or less inflation variability (and more output growth variability)?

Rules proponents believe this lack of clarity leads to imperfect policy in several ways. It leaves the markets guessing what the Fed will do next, which lowers efficiency and well-being by increasing uncertainty. It introduces human error into what they believe should be a fairly technical, mathematical process. Blinder explains that

> there are two basic ways to obtain quantitative information about the economy: you can study econometric evidence or you can ask your uncle.... I believe there is far too much uncle-asking in government circles in general and central banking circles in particular.[26]

Rule proponents further argue that because there is no quantitative goal underlying its actions, any error – unintentional or planned (e.g., short-term policymaking, popularity seeking behavior) – would go unchecked. Because there are fewer democratic checks on the Fed's power than most policymakers experience, critics believe that it is important to allow outsiders to hold the Fed accountable for its actions. Yet some would argue that the current system is structured in such a way that accountability is deterred. The primary oversight at present comes from semi-annual hearings before Congress. But because the Fed's mandate is so broad, vague, and subjective it can justify almost any action it undertakes as fulfilling its goal to promote low unemployment, low inflation, or moderate interest rates. Since some economic data will always contradict other data, the Fed can always point to something to justify its policy decisions. Hence, it is argued that it is difficult for Congress to offer specific criticism that could lead to any meaningful policy change. The President can remove Fed governors "for cause" before their term has ended, but not on the basis of policy differences or incompetence.[27] In practice, the President has never done so. While government agencies such as the Congressional Budget Office (CBO), General Accounting Office (GAO), and Joint Committee on Taxation, offer independent, non-partisan oversight analysis in many fields, the only review of monetary policy that Congress (officially) receives comes from the Fed itself. GAO is explicitly forbidden to audit monetary policy. Milton Friedman complains that the standard objectives of monetary policy, minimizing unemployment and inflation,

> are likely to be only very indirectly related to the real objectives of the actual policymakers...I suspect that by far and away the two most important variables...are avoiding accountability on the one hand and achieving public prestige on the other...those two elements...will I believe come far closer to rationalizing the behavior of the Federal Reserve over the past 75 years...[28]

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[25] Blinder, *op cit*, p. 5.

[26] Blinder, *op cit*, p. 8.

[27] See Federal Reserve Act, Section 1-078.

[28] Quoted in Stanley Fischer, "Rules versus Discretion in Monetary Policy," *National Bureau of Economic Research working paper 2518*, 1988.

Few economists concerned with the issue of accountability would advocate ending the Fed's independence – greater accountability would likely come at the cost of poorer long-term policy decisions if elected officials lacked the resolve to raise interest rates when necessary.[29] But proponents believe the adoption of a rule-based regime could increase accountability and clarify policy goals. Under a Taylor rule, the goals of monetary policy would be precisely laid out. Presumably, the rule would be based on a consensus of what goals the public would like to see pursued, since it is likely that the rule would be approved by Congress. And if a simple Taylor rule were implemented, subjective decisions, surprise policy shifts, and idiosyncratic goals become impossible. Policy changes based on hard data can be incorrect, but unlike changes based on instinct, these errors should cancel each other out on average. On the other hand, the critique below demonstrates that errors in rules stemming from data or model uncertainty may take an unacceptably long time to correct themselves.

Can Prevent "Fine Tuning"

A frequent criticism of central banks is that they are overly active in their policy changes due to a misguided desire to "fine tune" the economy. This criticism was widely heard during the 1970s when frequent changes in monetary policy did little to improve economic performance. A popular allegory illustrates why many economists criticize fine tuning. Many people will hop in the shower in the morning before it has fully heated up. They respond by turning the hot water up. Soon it becomes scalding, so they turn it down until it is freezing, and so on. They would experience a far more enjoyable shower if they had just left it on the original setting, even though it would have been cold at first. The central bank's decisions to change interest rates are equivalent to changing the temperature – they only take effect with a long lag, and a frequent criticism of the Fed is that policy swings excessively before the effects of previous rate changes have completely fed through to the economy.

Some economists criticize recent Fed policy as a good example of fine tuning gone awry. Between September and November 1998, the Fed lowered the federal funds rate three times. Although the economy was booming at the time, the Fed was concerned that the Russian debt default and the problems of the hedge fund Long Term Capital Management would lead to financial instability.[30] When financial calm was restored, the Fed increased interest rates six times between June 1999 and May 2000 to counter the previous cuts that by then had increased aggregate demand to unsustainable levels. In turn, these six increases were a factor in the economy's slowdown from the second half of 2000 until 2001. As a result, the Fed lowered interest rates six times in the first five months of 2001, by a cumulative total of 2.75 percentage points. Critics pose the counterfactual argument: would the economy have enjoyed smoother growth in the past two years if interest rates had never been changed? After all, the federal funds rate in mid-1998 was the same value as the federal funds rate in January 2001, after the Fed's second reduction of the year.

Some economists question whether the fine tuning critique is rigorous enough to translate into a useful policy prescription. As Alan Blinder quips,

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[29] For an overview and empirical evidence, respectively, see U.S. Library of Congress, Congressional Research Service, *The Economics of Federal Reserve Independence*, by Thomas Woodward, CRS Report 90-118E; and *Central Bank Independence and Economic Performance: What Does the Evidence Show?*, by Gail Makinen, CRS Report 97-767E.

[30] See U.S. Library of Congress, Congressional Research Service, *Financial Risk: An Overview of Market and Policy Decisions*, by Mark Jickling, CRS report RL31045.

> I fail to see any bright line – and maybe not even a dim one – between coarse tuning, which is what central bankers are supposed to do, and fine tuning, which is what they are supposed to avoid... (P)olicymakers must make *some* decision at each moment in time. Even doing nothing – whatever that means – is a decision.[31]

In the case of the 1998 financial unrest, weren't lower interest rates the appropriate response, even if it did constitute "fine tuning"? Would keeping interest rates constant truly have been a more appropriate, or even a more neutral, policy?

The exact definition of fine tuning is imprecise. If it is meant to imply that changes in interest rates should be infrequent, then this could easily be written into a policy rule. For instance, since changes in output occur more quickly than changes in inflation, interest rate changes could be made relatively infrequent by placing greater weight on the inflation variable than the output variable in the Taylor rule. Interest rate changes could also be made infrequent by adding an additional term to the Taylor rule that would make any new change partly dependent on the previous interest rate. In this case, the Taylor rule would read:

$$FFR_t = (R^*+I) + a(I-I^*) + b(Y-Y^*) + cFFR_{t-1}$$

where:

FFR_t = the new federal funds rate
FFR_{t-1} = the previous federal funds rate
R^* = the economy's equilibrium interest rate
I = the inflation rate
I^* = the desired inflation rate
Y = the economic growth rate
Y^* = the economy's long-run sustainable rate of growth.
a, b, c = parameters of the policymaker's choice

With a Taylor rule of this form and a relatively large (positive) value for the parameter c, large and/or frequent changes in the federal funds rate would be limited, assuming changes would continue to be rounded to 1/4 percentage point intervals. Even if changes in output and inflation suggested the rate should change, this would be counterbalanced to the extent that parameter c designates, which would keep the rate constant. Alternatively, if policymakers were not concerned with preventing fine tuning, they could adopt a Taylor rule that excluded the term FFR_{t-1}.

Non-Economic Considerations

This report considers the rules-discretion debate on the basis of economic efficiency. But some observers believe there are important issues relating to democracy and power that stem from the current institutional framework. Namely, they object to the concentration of discretionary power over financial and economic conditions in the hands of government officials who are not directly democratically accountable. Many of these observers favor institutional changes that would limit or eliminate this concentration of power such as the abolition of the Federal Reserve and its monopoly control of the money supply or a return to the gold standard. Economic theory suggests that these options would have serious economic costs. By removing the discretionary power of the Fed, the adoption of a Taylor rule regime might fulfill their aims with a far lower loss of economic efficiency.

[31] Blinder, *op cit*, p. 12.

Criticisms of Policy Rules

Unsurprisingly, a policy prescription that sounds good to economists in theory has come under fire as being impractical – and, in some ways, counterproductive – in the real world. The following section reviews major criticisms.

Does Alan Greenspan Obviate the Need for a Policy Rule?

Certainly, much of the support for policy rules grew out of the stagflation of the 1970s. To many economists of the time, the Fed's problems seemed incurable. To them, any drawbacks of giving up discretionary control were clearly outweighed by the palpable drawbacks of *keeping* discretion. But today's economy is much different from the 1970s. Inflation has been below 4% since 1992 and the current economic expansion has now become the longest in U.S. history. To many, credit for this turn of events lies in no small part to the work of the Fed under Chairman Alan Greenspan. In these circumstances, it is useful to revisit the question of whether the drawbacks of discretionary policy outweigh the drawbacks of policy rules. As proof that the drawbacks have become negligible in the 1990s, proponents of discretion can point to the fact that work by John Taylor himself suggests that the Fed's decisions in the 1990s closely parallel the decisions suggested by the Taylor rule.[32] As economist Benjamin Friedman quips,

> "Most of the economists who have advocated monetary policy rules in the past...would be startled to think that the main import of that entire line of research had been merely to provide new words to describe what our central bank, in its wisdom, has been doing all these years anyway."[33]

This is a far cry from the past. Taylor's research suggests that in the 1960s and 1970s monetary policy under a rule would have greatly differed from the historical experience.

The Fed's recent performance is a powerful argument to many observers that problems with credibility under discretion have become insignificant. As discussed above, one major purported benefit of a rule is that it would enhance the Fed's credibility, making changes in policy quicker and less costly since people's expectations would change more quickly. Yet it is hard to imagine that the Fed could gain more credibility with the public than it has in the Greenspan era.[34]

Economist Frederic Mishkin has made three rebuttals to this argument. First, at some point the septuagenarian Chairman must retire. There is no guarantee that his successor will be as capable as he has been. Second, the Clinton Administration was highly supportive of the Fed's independence even when interest rates were increasing. There is no guarantee that some future Administration will not attempt to pressure the Fed into making inferior trade-offs for short-term advantage. Third, it can be questioned whether the good economic fortune of the 1990s was not attributable to just that – the good fortune of not having experienced any large, negative economic shocks throughout that decade. There is no way of testing the counterfactual argument that if the economy had experienced a large economic shock, discretionary policy would have outperformed a policy rule (since it arguably did not in the 1970s) and the Fed would still have been able to withstand political pressure (which would presumably have been greater under adverse conditions) to exploit short-term policy gains.[35] In fact, the Fed faced positive supply shocks in

[32] Taylor 1999, *op cit*, p. 338.

[33] Solow and Taylor, *op cit*, p. 63.

[34] For example, see "Almighty Alan Greenspan," *The Economist*, January 6, 2000.

[35] Taylor 1999, *op cit*, p. 330.

the late 1990s such as unexpectedly high productivity growth and low energy prices that probably subdued inflationary pressures.

Could the Fed Quell a Financial Panic Under a Policy Rule?

In normal circumstances, aiming to stabilize inflation and output may be sufficient tasks for the central bank to sustain a sound economy, and may be tasks that a policy rule is capable of achieving. But in times of financial panic, opponents would argue that a policy rule would be inadequate.

The financial sector plays a unique role in an economy, and panic in that sector can easily spill over into much greater macroeconomic problems. It is not coincidental that the country's most serious bank panic of the 20th century took place during the Great Depression. This experience reinforced the belief that an important role of the central bank is to act as a lender of last resort. Oftentimes, a major component of financial panic is a lack of liquidity – there is nothing fundamentally unsound about borrowers or financial intermediaries, they are simply unable to convert their assets into the cash that they need to meet their current obligations.

Many economists believe that only the central bank, with its ability to create money at will, can offer the financial system enough liquidity to quell panic. Increasing liquidity refers to an easing of monetary policy through open market operations in response to financial rather than macroeconomic (e.g., inflation and output growth) developments. Examples include events following the stock market crash of 1987 and the Russian debt default of 1998. In both cases, the Fed aggressively lowered the federal funds rate in response to financial market unrest although economic growth was strong. As the increased liquidity replenished the reserves of financial institutions, concern subsided. If interest rates were lowered to increase liquidity during financial panic, a simple policy rule would be violated since macroeconomic conditions governing the rule would not have changed, or at least would not yet have been measured to change (see the section entitled "Problems with Data Collection").[36]

The effectiveness of the Fed's lender of last resort function would also be hampered by a policy rule. This function refers to direct lending through the discount window by the Fed to a particular troubled institution or institutions. It is undertaken because oftentimes problems at one large institution can spread to a more generalized financial panic if left unchecked. Under a Taylor rule, discount window lending could still be used to help specific troubled institutions. But discount window lending could not be used to increase overall liquidity in the financial system. The Fed lends through the discount window to restore banks' depleted reserves, and the federal funds rate is the market rate at which bank reserves are lent. As discount window lending makes reserves more plentiful, all else equal, their price – the federal funds rate – would fall, violating the policy rule. Thus, to adhere to a Taylor rule, the increase in liquidity caused by discount window lending would need to be neutralized through contractionary open market operations, making it a zero-sum game. This would make the Fed's lender of last resort powers far more modest than at present. In a serious financial panic, it may be of limited use since it would amount to "robbing Peter to pay Paul" – increasing a troubled bank's liquidity could only be accomplished by reducing the liquidity of other banks.

[36] Keeping the interest rate constant during a liquidity crisis, as a simple Taylor rule would do, implies some loosening of policy since the rising demand for reserves would otherwise push up rates. But many rule proponents who have acknowledged this problem have admitted that this may not be enough to quell panic.

It seems impossible to write a quantitative policy rule that would increase liquidity during a financial panic. Bennett McCallum suggests that the rule should only be adhered to as a quarterly average, allowing the federal funds rate to be lowered for short periods of time during liquidity crises.[37] Other rule proponents, including John Taylor, have suggested suspending the rule during financial crises. But opponents of rules have forcefully argued that many of the advantages offered for having a policy rule are invalid if the rule can be abrogated. "Panic" is a subjective concept and, therefore, lowers accountability and may be open to manipulation by policymakers with a desire to exploit short-term trade-offs. The ability to abrogate rules may negate the additional credibility that rules are meant to offer. Most importantly, the argument that policy surprises should never be allowed because individuals have already incorporated all economic uncertainty in their decisions would be clearly violated if rules could be abrogated. Under this reasoning, individuals could only be worse off when rules are abrogated, even in crisis, because it would increase their uncertainty.

Problems with Lags

Under a Taylor rule, interest rates would be changed when data become available that indicate that output or inflation has changed from its desired path. Unlike discretionary policy, a Taylor rule cannot be preemptive and change interest rates before output and inflation have actually changed. However, preemptive changes are often necessary since changes in interest rates do not affect inflation and output immediately. Most estimates indicate that interest rate changes take anywhere between six months and two years to become fully effective. This implies that the Taylor rule could cause long periods of inferior economic performance before the economy was brought back to equilibrium. Thus, critics argue that the Fed's ability to account for these lags and stay one step ahead of the game gives discretion an important advantage over rules.[38] It is important to note that lags are one of the main reasons why discretionary policy decisions are sometimes incorrect, yet rules – advocated by some as a way to avoid discretionary errors – may do nothing to improve on those types of mistakes.

Taylor rule proponents have at least three replies to this argument. First, some variants of the Taylor rule address this criticism directly by making the federal funds rate dependent on forecasts (1-2 years in the future) of output and inflation, rather than on their current values.[39] Thus, these types of rules are as forward looking as discretionary policy can be. Other proponents argue that their simulations demonstrate that despite the lags in effectiveness that they build into their models, using current data delivers economic performance comparable to rules that use forecasts. Thus, they see the lag argument as a straw man. Such conclusions, however, are highly dependent upon their modeling of the economy. Specifically, the results are dependent on the assumption that individuals have forward looking expectations of the future that cause long-term interest rates to change at the same time as monetary policy changes short-term interest rates. Finally, although correct intuition about the future direction of the economy may allow discretionary policy to

[37] Bennett McCallum, "Monetary Policy Rules and Financial Stability," *National Bureau of Economic Research working paper 4692*, 1994.

[38] These lags in policy effectiveness may also make a simple Taylor rule overshoot the desired interest rate when the economy is coming out of a recession. Imagine that the economy enters a recession and the federal funds rate must be lowered one percentage point for economic recovery. Once this one percentage point decrease is (eventually) fed into the Taylor rule, it would take time, say a year, for the change to have its full effect on the economy. Since one year later, the changes would not have yet fully affected the economy, the Taylor rule would lower the federal funds rate further, to a point that might overstimulate the economy once the later rate reduction fully took effect.

[39] Since forecasting is far from a science, using forecasts in a Taylor rule could potentially have the unintended consequence of shifting discretion from policymaking into forecast making, unless the Fed were required to use outside forecasts.

outperform a Taylor rule, intuition is as likely to be incorrect, in which case discretion would not deliver better results.

Problems with Data Collection

Lags in data collection would exacerbate the lags in monetary policy that would be problematic under a Taylor rule. For instance, GDP data are only available on a quarterly basis at present, and are released nearly a month after the quarter ends. If growth slows significantly in a quarter, as it did in the fourth quarter of 2000, monetary policy rules could not react to this slowdown until 2001. Again, using forecasts in a Taylor rule rather than actual data would be one way to avoid lags in data collection. And with enough additional resources, data could be collected and released more quickly.

Measurement problems with data also cast doubt upon the efficacy of a simple rule. For example, measurement problems with the consumer price index (CPI) are well documented.[40] It is most accurate to view the CPI as giving a snapshot of inflationary pressures in the country, but an imprecise snapshot. Under discretionary policy, the Fed can use its expertise and compare other data sources to judge whether the CPI is giving an accurate portrait of inflationary pressures at any given time. Under a Taylor rule, no such judgement can be made – the CPI, whether it is right or wrong, would be fed directly into the interest rate decision.

Another practical problem with a Taylor rule policy regime is the substantial revisions that data routinely undergo. For example, in 1990 when GDP data were first released they showed an economy that was still growing, albeit slowly. Once the data were revised months later, they revealed that the economy had actually suffered a three quarter recession from 1990-1991. Had the Taylor rule been in place at the time, the preliminary data might have kept interest rates constant when a rate cut would have been more appropriate.

Taylor rule proponents would argue that these drawbacks are equally important under a discretionary regime. Again, they would argue that simply because the Fed can follow its "gut instinct" under discretionary policy does not imply that its "gut instinct" will be correct. In fact, in the case of the 1990 recession the Fed arguably reacted too slowly to deteriorating economic conditions. With the aid of hindsight, we know that the contraction began in the third quarter of 1990, yet interest rates were not aggressively lowered until the beginning of 1991. In part, this was because the Fed was reliant on that same incorrect preliminary data as would a rule based policy regime. Again, neither rules nor discretion have an obvious advantage in avoiding the difficulties endemic to monetary policy.

Model Uncertainty

Perhaps where the argument for a Taylor rule is weakest is in the evidence that its proponents provide to prove that a Taylor rule would work better than discretionary policy. Since no country has ever formally adopted a policy similar to a Taylor rule, there is no empirical evidence to compare the two policy regimes.[41] Instead, Taylor rule proponents use simulation results which,

[40] See U.S. Library of Congress, Congressional Research Service, *The Consumer Price Index: Recent Improvements and Prospective Changes*, by Brian Cashell, CRS report RL30019.

[41] Some countries have adopted inflation targets. Many of these countries have experienced lower and less volatile inflation since the adoption of inflation targets. This favorable experience may be colored more by other developments. For example, some of these countries simultaneously increased the independence of their central banks, a consensus emerged among central bankers in the 1990s that low and stable inflation was desirable, and the 1990s were relatively free of the types of negative external shocks that lead to poor macroeconomic performance. Furthermore, if inflation

they claim, demonstrate that if a Taylor rule had been in place historically, economic performance would have been superior to actual experience.

Critics claim that these simulation results prove nothing. There is no way to tell how a very complex economy would have actually responded to a hypothetical situation. A model is a very simple approximation of the economy, and the results that models generate are highly reliant on the assumptions that are made within the model. There is no consensus in the macroeconomic literature about what assumptions should be made in these models, so the structure of the models vary widely. Economist Bennett McCallum cites money demand, consumption behavior, investment demand, and exchange rate effects as important aspects of a macroeconomic model where there is a lack of understanding and consensus among economists.[42] As a result, Taylor rules that do well in one particular model may prove unstable in another model, even though the models are estimated and simulated with the same actual data from the U.S. economy. At an NBER conference, a Taylor rule with the same parameters was fed into different models based on the same U.S. data, and the simulated performance of the economy varied widely from model to model. In some models, the Taylor rule caused the variability of inflation and output to reach infinity.[43] Critics conclude that if a rule cannot perform well from model to model, it has little chance of performing well in the actual economy.[44]

McCallum, a policy rule proponent, addresses this model uncertainty problem by stressing the importance of devising Taylor rules that generate positive results across a variety of different models, rather than looking for the best rule in any particular model. His research suggests that simple Taylor rules, in which interest rates respond to only a few variables, seem to meet this criterion more consistently than complex rules. Rules that respond to changing economic conditions with cautious policy changes rather than aggressive responses also seem to do better across many different models.[45] McCallum also stresses the need for a Taylor rule that depends on prompt and reliable data – unlike the GDP data that come out quarterly and are often subject to considerable revision.[46]

How Fast Can the Economy Grow?

To operate a Taylor rule, certain assumptions must be made about equilibrium economic conditions since policy changes must be made relative to some benchmark. Donald Kohn of the Fed believes that

> "(Fed) Members seem to regard the use of rules to guide policy as questionable in part because they are uncertain about the quantitative specifications of the most basic inputs required by most rules and model exercises. They have little confidence in estimates of the size of the output gap, the level of the natural or equilibrium real interest rate, or even the

targeting did prove superior empirically, this does not prove the case for the Taylor rule since, as noted below, targets still allow the central bank to act with discretion.

[42] Bennett McCallum, "Issues in the Design of Monetary Policy Rules," *National Bureau of Economic Research working paper 6016*, 1997.

[43] Taylor, 1999, *op cit*, pp. 1-14.

[44] Some of these models are also open to the Lucas Critique – they assume that individuals would act the same way under a Taylor rule as they did historically under discretionary policy. Yet the fact that the Taylor rule is supposed to improve decision making behavior suggests that these simulation results may be invalid.

[45] Taylor, ed., 1999, *op cit.*, p. 15.

[46] Bennet McCallum, "Issues in the Design of Monetary Policy Rules," *National Bureau of Economic Research working paper 6016*, 1997.

> level of the actual interest rate, since inflation expectations are at best only imperfectly observable."[47]

It is difficult enough to estimate equilibrium values for these variables, but what makes this effort particularly problematic is that these values may unexpectedly change. To understand why this is problematic, one can take the example of economic growth. Virtually all Taylor rules are concerned with minimizing the variability of output. But to minimize the variability of output, it must be relative to a standard, which is the sustainable rate of economic growth. Unfortunately, the sustainable rate of growth is unknown and seems to have increased in the late 1990s thanks to a surge in productivity growth.[48] A likely alternative would be the unemployment rate, but the natural rate of unemployment has been equally unstable (downward) in recent years.[49]

Much of the credit that Alan Greenspan has received from many analysts is due to the fact that he recognized that the sustainable growth rate seemed to be rising in the late 1990s, and did not raise interest rates when actual growth increased above a level previously believed to be unsustainable. The Taylor rule may have suggested the opposite policy. Using the first Taylor rule presented, if one had assumed that the sustainable rate of growth was 2.5%, as it seems to have been from about the mid-1970s to the mid-1990s, then when growth increased to 3.5% in 1996, the federal funds rate would have been raised by one-half percentage points although inflation was not increasing. Had growth continued to exceed 2.5% in the following years, the federal funds rate would have continued to be raised. Eventually, the sustainable growth rate used in the Taylor rule could have been changed, but this would probably have been done very cautiously, as modifications to the rule would always be viewed with a suspicion of ulterior motives.

Taylor rule proponents can rebut this argument in three ways. First, in the long run monetary policy has no real effect on GDP. Thus, incorporating an incorrect sustainable growth rate in a Taylor rule can have no permanent effect on growth. Second, in the medium run a policy of incorrectly high interest rates, brought about by an mistakenly low sustainable growth estimate, would slow the inflation rate below its target in the Taylor rule. This would cause the federal funds rate to be lowered. But as always, John Maynard Keynes' timeless saying is applicable to these two arguments: "in the long run we are all dead." Third, as can always be argued against discretionary policy, in this case the Greenspan Fed made the correct subjective judgment that the sustainable growth rate had increased. But it could have just as easily made an incorrect judgment. Had its judgment been wrong, the economy would have performed poorly.

Comparing the Taylor Rule to Other Policy Regimes

The Taylor rule has not been the only alternative offered to discretionary policy. Most alternatives are motivated by similar arguments to those used by Taylor rule proponents. This section compares these alternatives on the basis of the purported benefits and drawbacks to the Taylor rule discussed above.

[47] Taylor, 1999, *op cit*, p. 195.

[48] For more information, see U.S. Library of Congress, Congressional Research Service, *The New Economic Paradigm: Is It New and Is It a Paradigm?* by Marc Labonte and Gail Makinen, CRS Report 98-90E.

[49] For more information, see U.S. Library of Congress, Congressional Research Service, *Why Has the Unemployment Rate Fallen When Inflation Is Stable?*, by Marc Labonte, CRS Report RL30738.

Inflation Targeting

Inflation targeting can be thought of as a rule that is in some ways stricter than the Taylor rule, but in practice more lax. Economist Lars Svensson distinguishes between instrument rules, like the Taylor rule, and target rules, like inflation targeting.[50] Instrument rules instruct the central bank how to mechanically implement monetary policy. Under the Taylor rule, the central bank is precisely instructed when and by how much interest rates should change based on changes in economic data. By contrast, targeting rules give the central bank a goal, but allow it discretion in choosing how to accomplish that goal. Under inflation targeting, which many central banks have adopted,[51] the central bank is instructed to change interest rates as it sees fit such that a predetermined inflation rate is maintained (or inflation is kept within a predetermined band.)

In theory, inflation targeting could be stricter than a Taylor rule. If central banks were mandated to literally maintain a particular inflation rate without any deviation, then central banks could not react to changes in output at all, and output volatility would probably be much greater than desired – especially when the economy was hit by supply shocks. Under a fairly standard assumption that output responds to changes in interest rates faster than inflation, it seems likely that short, sharp downturns would be necessary to wring inflation out of the system if inflation were to be able to hit its target quickly.[52]

In practice, no central bank seems to target inflation so strictly. Instead, they aim to keep the inflation forecast for a year or two in advance within the target range, and do not react strictly when actual inflation misses its forecast.[53] By operating in this way, central banks can diminish output volatility in practice. To an extent, responding to changes in output reinforces their goal of keeping the inflation forecast stable because present changes in output have some influence on future inflation.

In practice, central banks with inflation targets seem to enjoy modestly less discretion than the Fed since they need to demonstrate that they are working towards a precise goal. But they clearly enjoy much more discretion than a Taylor rule regime envisions. There is still the potential for the central bank to change policy in subjective, idiosyncratic ways, at least temporarily. And to date, no central bank has been admonished for missing its target. Economists Ben Bernanke and Frederic Mishkin explain that

> "interpreting inflation targeting as a type of monetary policy rule is a fundamental mischaracterization of this approach *as it is actually practiced by contemporary central banks*.... It is most fruitful to think of inflation targeting not as a rule, but as a framework for monetary policy within which 'constrained discretion' can be exercised."[54]

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[50] Lars Svensson, "Inflation Targeting as a Monetary Policy Rule," *National Bureau of Economic Research working paper 6790*, 1998.

[51] These banks include the Bank of England, the European Central Bank, and the Reserve Bank of New Zealand. For more information, see U.S. Library of Congress, Congressional Research Service, *"Price Stability" as the Sole Goal of Monetary Policy: The Experience of Five Countries*, by Gail Makinen, CRS Report 98-719E; *Would Committing the Federal Reserve to a Goal of Price Stability Promote Economic Efficiency?*, by William Bomberger and Gail Makinen, CRS Report RL30102.

[52] For example, imagine that inflation responds to interest rate changes in one year and output responds to changes in six months. If inflation was above its target, interest rates would have to sharply rise. In six months, this might lead to a recession, yet under a strict target, since inflation had not yet fully responded to the previous change, interest rates could not be lowered and might even be raised further.

[53] It can be questioned if a strict inflation target technically could be maintained without error over a short time horizon since monetary policy affects inflation with a lag. The same is true for a nominal GDP target.

[54] Ben Bernanke and Frederic Mishkin, "Inflation Targeting: A New Framework for Monetary Policy?" *Journal of*

Thus, in practice inflation targeting can be thought to both enjoy the purported benefits of a Taylor rule and suffer the purported drawbacks of a Taylor rule, but to a much lesser extent than the Taylor rule does on both counts. It should probably be compared to the Taylor rule on these grounds, not on the grounds it was originally envisioned. Inflation targeting in practice may have its merits, but it does not appear to offer the constraints that its original proponents envisioned.

Nominal GDP Targeting

Since an inflation target, if strictly applied, cannot respond sufficiently to output shocks, some economists have suggested a somewhat different policy rule that targets nominal GDP.[55] While this is a target rule rather than an instrument rule, the goals of the target are the same as the Taylor rule – to allow monetary policy to react to both changes in inflation and changes in output. Since nominal GDP is merely the sum of real GDP and the inflation rate, under a nominal GDP target one can only increase if the other decreases.

The difference between the two, therefore, comes primarily in the implementation of policy. The Taylor rule tells policymakers how to react to policy developments whereas the nominal GDP target tells policymakers to use their discretion to hit their target. But it is unclear how to enforce accountability under a nominal GDP target. Because large errors are typical in forecasting and the economy is often hit with unpredictable shocks, it may be technically infeasible to expect a central bank to hit a nominal GDP target. If a GDP target were missed because of an unexpected shock, it does not seem clear that the central bank should be reprimanded. But if a nominal GDP target cannot be reached, then how can the central bank's performance be objectively evaluated? When policy errors led to a missed target, what would prevent the central bank from claiming that shocks were to blame?

The Gold Standard

The earliest constraint on central bank discretion was a monetary arrangement that pre-dated the existence of central banks in many countries. This was the gold standard, the monetary policy regime of the United States and much of Western Europe during parts of the nineteenth and early twentieth centuries. A key tenet of early supporters of the gold standard was that money was only "sound" if it was backed by gold at a fixed rate. The monetary authority could only be prevented from "debasing" the currency through inflationary finance if citizens reserved the right to exchange their paper currency for gold at a predetermined rate.

A gold standard is implemented and maintained by the government specifying a price of gold and then buying or selling whatever amount of gold is necessary to keep its price constant. Once the price is set, the non-monetary use of gold and the cost of mining will determine the U.S. money supply. Thus, a goal such as price stability is no longer attainable, as the government would no longer be able to change the money supply or the federal funds rate to meet changing financial conditions. Thus, in proponents' eyes, it would no longer be possible for the monetary authority to abuse its power. Under a gold standard, the goal of monetary policy is clear and immediate, and there is no opportunity for the monetary authority to stray from that goal to promote other goals. By changing the means by which monetary policy is executed, its goals have necessarily been changed as well. Under a gold standard, the stability of inflation and output growth, for

Economic Perspectives, v.11, n.2, Spring 1997, p. 106.

[55] For example, see Robert Hall and Gregory Mankiw, "Nominal Income Targeting," in Mankiw, ed., *Monetary Policy*, National Bureau of Economic Research, 1994, p. 71.

example, could no longer be goals; maintaining a constant price of gold would be the only function of monetary policy.[56]

The problem that most economists see with keeping the price of gold constant is the fact that the relative value of gold, like any other commodity, is not constant over time. It fluctuates as non-monetary demand (e.g., how many people desire to buy jewelry) and the supply of gold (largely determined by the cost of mining) change. Gold standard proponents often dismiss this problem, but theory suggests that it is very serious: the inflation rate for the entire country is decided by factors that have little to do with the health of the economy. Specifically, for the gold standard to provide a low and stable inflation rate, the supply of gold would need to grow at the rate consistent with the rate at which the economy and the demand for gold are growing.

In fact, neither of these things has happened, and the nominal price of gold has fallen consistently in the past 13 years. As measured by the producer price index, the price of gold is now 35% lower than it was in 1987. Whether or not the dollar price of gold is kept constant by a gold standard, the value of gold compared to hamburgers, cars, haircuts, and all other goods and services has fallen over this time period. To maintain a gold standard during this time, the United States would have needed to experience deflation, a falling general price level, of 35% from 1987 to 2000. Deflation would be necessary because only a shrinking money supply could keep the price of gold constant when the value of gold falls. If the amount of money in circulation is falling, the price of all goods and services must fall. Because prices are not completely flexible, they cannot fall immediately, and deflation would have likely caused higher unemployment and lower growth. This happened in practice several times when the United States operated a gold standard during the 19th century.[57] From 1873-1933, the United States experienced 17 years of deflation, several years of zero inflation, and 17 recessions.[58]

By preventing the government from implementing a discretionary monetary policy, a gold standard also arguably would remove the Fed's ability to act as a lender of last resort and add liquidity to the financial system during times of crisis.[59] Some economists believe that the maintenance of the gold standard until 1933 was one of the key reasons that the money supply shrank so dramatically from 1929-1933, and why the Fed was unable to end the banking crisis during the Great Depression. All of these factors suggest that if one's goal is to remove the Fed's discretionary powers, a Taylor rule can achieve those goals with a much lower loss of economic welfare than the re-adoption of a gold standard.

[56] Historically, a gold standard has been used to pursue a goal of fixed international exchange rates. Exchange rate stability is a benefit that would partially offset the likely cost of greater inflation and output variability that a gold standard would cause. This goal can only be accomplished if one's trading partners are also using a gold standard. If the United States adopted a gold standard unilaterally, and our trading partners did not, such an action would not achieve fixed exchange rates. Many gold standard proponents believe that the economic might of the U.S. would lead other countries to willingly join a gold standard if this nation did, thus producing fixed exchange rates.

[57] A quasi-gold standard was in operation in the United States from 1934-1973. Because it was not a true gold standard, the monetary policy used during this period did not constrain the use of discretionary monetary policy in practice. For more information, see CRS Report 96-986E, *Brief History of the Gold Standard in the United States*, by Thomas Woodward.

[58] National Bureau of Economic Research and Consumer Price Index.

[59] The Fed might still be able to act as lender of last resort by lending troubled banks its excess gold reserves under a system where currency was not 100% backed by gold. However, it could not provide banks unlimited liquidity, as it can do in the current system.

Appendix: The History of Monetary Policy Rules

While the Taylor rule may be the most popular rule in academic circles at present, it is by no means the first. The gold standard can be thought of as the first policy rule regime, and when it collapsed (for the final time), economists wary of discretionary policy began formulating alternatives. This section will give a historical review of the literature to explain why economists have proposed policy rules, how these propositions have changed over time, and the economic circumstances that have motivated those views.

Friedman's Money Supply Rule

One of the first prominent proponents of a rule based policy for the Federal Reserve is Nobel Laureate Milton Friedman. An important part of Friedman's intellectual effort has been spent on the monetary history of the United States and it has convinced him that the Federal Reserve has been responsible for many of the demand shocks that have generated the business cycle in U.S. history. He has been especially critical of Fed performance during the "great contraction" in the money stock that occurred during 1929-1933. Without this contraction, which the Fed did little to prevent and may have set in motion, he has argued, the Great Depression would have been a mild downturn. In his opinion, this is only the most egregious instance of perverse Fed policy.

In order to minimize demand shocks of a monetary nature from occurring, Prof. Friedman proposed replacing the monetary policy decision making center at the Federal Reserve by a rule that fixed the growth rate of the money supply. The quantitative parameters of the rule depended on the measure of the money supply involved. Prof. Friedman observed that the *turnover rate* of the M1 measure of money grew, on average, about 3% per year over the period 1960-1980. Since economic output also grew on average about 3% per year, price stability could be achieved if the M1 measure of money were held constant. Friedman also observed that the *turnover rate* of the M2 measure of money was virtually constant over the period 1960-1990. This being the case, for money spending (using M2 as the measure of money) to grow 3% per year would require M2 to grow by that percentage. His growth rate rule for M2 embodied this finding.[60]

For the Friedman rule to operate, two conditions had to prevail. First, the turnover rate of money needed to be stable and predictable. If the turnover rate were not stable but varied in an unpredictable fashion, then the growth rate rule would not eliminate monetary shocks and, arguably, could be more destabilizing than the discretion that Friedman dreaded. Second, the international exchange rate regime prevailing at the time that used fixed or pegged exchange rates would have to be scrapped. Friedman's rule would only operate in a world of flexible exchange rates since the money growth rate rule might conflict with the need to keep the exchange rate peg unchanged. It should also be noted that Friedman's rule would prevent the Federal Reserve from performing its role as a lender-of-last resort. So long as it adhered to the rule, it could not respond to financial crises.

Friedman claimed his proposal for a rule-based monetary policy to be not merely economically superior to discretion, but more consistent with the goals of liberty and democracy as well. He

[60] M1 and M2 are different definitions of money measured by the Federal Reserve. M1 includes currency, traveler's checks, demand deposits, and other checkable accounts. M2 includes the same categories of assets as M1 as well as time and savings deposits under $100,000, individual holdings in money market mutual funds, and money market deposit accounts.

could not accept the undemocratic concentration of power in the hands of a few unelected individuals that an independent Federal Reserve represented:

> The problem is to establish institutional arrangements that will enable government to exercise responsibility for money, yet will at the same time limit the power from being used in ways that will tend to weaken rather than strengthen a free society.[61]

In Friedman's eyes, the contrast between rules and discretion in monetary policy was analogous to the contrast between the Bill of Rights and leaving decisions of liberty in the hands of the legislature. He reasoned satirically,

> Why not take up each (free speech) case separately and treat it on its own merits? Is this not the counterpart to the ususal argument in monetary policy that it is undesirable to tie the hands of the monetary authority in advance; that it should be left free to treat each case on its merits as it comes up? Why is not the argument equally valid for speech?[62]

The fate that befell the Friedman rule may prove illustrative of the fate that awaits other rule-based regimes. The stability and predictability of the turnover rate of both M1 and M2 vanished. Both became unstable and unpredictable over the last 20 years of the 20th century. Once this happened, the blind adherence to such a rule would, ultimately, have been the cause of substantial economic instability. Friedman believed that it was not necessarily money demand that was unstable, but rather the way it was measured. He, and many other economists, devoted later research efforts to finding some measurement of money that would prove more stable than M1 or M2, and could therefore be used in a monetary policy rule. The search continues, however, for a stable and predictable measure of money. Other researchers, including John Taylor, would instead attempt to develop alternative policy rules that were not reliant on a stable relationship between the money supply and aggregate demand.

The Rational Expectations Revolution

Until the 1970s, economists Robert Lucas and Thomas Sargent complained that macroeconomic theory was based on ad-hoc, rule-of-thumb, invariant assumptions about human behavior at the aggregate level.[63] This branch of the discipline was somewhat divorced from microeconomic theory, which built behavioral response models based upon rational, well-informed, welfare-maximizing economic agents. What these macroeconomic models seemed to lack in theory was compensated by their empirical predictive power at the time. Important, observable economic phenomena such as recessions, slow price adjustment, and the stabilizing effect of monetary and fiscal policy could all be well accounted for in econometric studies based on these Keynesian models.

"Rational expectations" economists such as Lucas and Sargent arguably led a methodological revolution in macroeconomics in the 1970s by rejecting as invalid any model that was not based on rational agents maximizing their welfare on the basis of the information available to them. This meant that many of the Keynesian workhorse models of the time had to go, and they replaced them with models based upon "microeconomic foundations." Furthermore, they claimed that econometric studies that employed these models yielded meaningless results – they could only show correlation, not causation, and thus could have no predictive power. Perhaps the reason

[61] Milton Friedman, "An Independent Monetary Authority," in Leland Yeager, ed., *In Search of A Monetary Constitution*, Harvard University Press, (Cambridge: 1962), p. 220.

[62] *Ibid*, p. 240.

[63] Lucas and Sargent, *op cit.*

why this methodological revolution was so important is that these new models allowed for a much richer, more complex application of mathematics to the solution of such models.

Unfortunately, what the rational expectations models gained in terms of mathematical richness, they lost in terms of applicability to empirical, real-world problems. In fact, this is the reason that Keynesian economics originally departed from classical models based upon microeconomic foundations. Taken by themselves, models that assume welfare-maximizing behavior and perfect markets have difficulty explaining problems such as why recessions occur and why monetary policy has real effects on the economy – full and instantaneous adjustment by rational agents precludes the possibility of these phenomena.

This can be demonstrated by looking at Lucas and Sargent's critique of discretionary monetary policy. They reject the implicit Keynesian assumption that people can be fooled indefinitely into increasing economic output when monetary policy is loosened without ever adjusting their expectations of future inflation. But taking this critique to its logical conclusion, they argue that changes in monetary policy will *never* influence real economic output unless they are unexpected, because people will always completely adjust their behavior when policy is predictably changed. To assume otherwise, one must assume either that the government is more intelligent than private individuals, which the authors reject, or that they have access to more information. It is only by making unexpected changes in policy (because of privileged information) that the central bank can prevent or delay people from adjusting their behavior to the policy change and, thus, generate real effects on output.[64] But if this is true, discretionary policy can only have a destabilizing effect on the economy, and the central bank should be restrained from behaving unpredictably.[65]

Similarly, many economists posited the existence of a political business cycle, where policymakers would be tempted to exploit short-run tradeoffs between inflation and unemployment at election time, to the detriment of long-run price stability.[66] Even in the absence of political pressures, policymakers may find unanticipated inflation to be beneficial in the short run, even if it is harmful in the long run. For instance, policymakers may find an unanticipated inflationary monetary policy useful when the country is faced with war, as has always happened historically, or an oil shock, as happened in the 1970s.[67] People may be fooled by unanticipated inflation at first, and if the policymaker's time horizon is short enough, the policymaker would not care if people cannot be fooled a second time. But society is worse off because once the central bank loses its credibility, monetary policy would be less effective in the future.

Another aspect of rational expectations methodology with important ramifications for monetary policy is the use of a mathematical method known as dynamic programming. Dynamic programming allows economists to model the way individuals make decisions over time. In this process, an individual's decisions today depend on decisions in the future. The future may be uncertain, but the individual takes that into account when making decisions today. Dynamic programming relates to monetary policy (and any other action by the government) through its implication that individuals have already made their optimal decisions based on their knowledge of future uncertainty. Thus, their well-being cannot be enhanced by changing policy when circumstances change. In fact, it makes them worse off, by creating more uncertainty – if

[64] Robert Lucas, "An Equilibrium Model of the Business Cycle" Journal of Political Economy, v.83, n.6, Dec 1975, p. 1113.

[65] Lucas and Sargent, *op cit,* p. 63.

[66] William Nordhaus, "The Political Business Cycle," *Review of Economic Studies,* v. 42, 1975, p. 169.

[67] Robert Barro and David Gordon, "Rules, Discretion, and Reputation in a Model of Monetary Policy, *Journal of Monetary Economics,* v. 11, 1983, p. 101.

individuals knew that monetary policy would have been changed in, say 2001, they would not have made the decisions they made in 2000.

Economic events in the 1970s seemed to confirm the rational expectations critique – Lucas and Sargent refer to Keynesian forecasting models in the 1970s "econometric failure on a grand scale."[68] The ability of the government to use fiscal and monetary policy to achieve low unemployment and low inflation seemed to collapse. Consensus among macroeconomists in the 1960s held that fiscal and monetary policy could hold inflation and unemployment constant at 4% – instead, unemployment reached 8.5% and inflation reached 9.1% in 1975.

Lucas' and Sargent's work did a great deal to force economists to re-examine their belief that discretionary policy could be used to "fine tune" an economy with better results than a simple rule akin to Milton Friedman's money growth rule, and spurred research to find new rules superior to Friedman's rule. Their contribution is implicitly acknowledged in the Taylor rule, which is meant to reduce individuals' uncertainty by making interest rate changes predictable and dependent solely on changes in economic data. By removing the Fed's discretionary powers, the Taylor rule is also meant to remove its ability to "fool" people in order to exploit short-term tradeoffs.

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[68] Lucas and Sargent, *op cit*, p. 57.